What is claimed is:

1.   A method for the assessment of a joint, comprising: measuring
musculoskeletal dynamics of a joint of a patient with the patient in a posture that is
weight-bearing through said joint.

2.   The method of claim 1, wherein said measuring musculoskeletal dynamics of
a joint involves measuring musculoskeletal dynamics of an ankle.

3.   The method of claim 2, wherein said measuring involves measuring
musculoskeletal dynamics of an ankle in an inversion and/or eversion direction of
rotation.

4.   The method of claim 2, wherein said measuring musculoskeletal dynamics
includes measuring inertia.

5.   The method of claim 2, wherein said measuring musculoskeletal dynamics
includes measuring damping.

6.   The method of claim 5, wherein said measuring musculoskeletal dynamics
includes measuring neuro-mechanical resistance to rotational velocity.

7.   The method of claim 2, wherein said measuring musculoskeletal dynamics
includes measuring stiffness.

8.   The method of claim 7, wherein said measuring musculoskeletal dynamics
includes measuring neuro-mechanical resistance to ankle rotational angle.

9.   The method of claim 1, wherein said measuring musculoskeletal dynamics
includes applying at least one pulse so as to excite a natural frequency at said joint.

10.   The method of claim 9, where said measuring musculoskeletal dynamics includes acquiring position and torque sensor data after initiating said at least one pulse.

5   11.   The method of claim 10, wherein said measuring musculoskeletal dynamics includes determining values of I, b or k based on the position and torque sensor data in accordance with the following formula:

$$\{ -I\omega^2 + ib\omega + k \} \, \Theta \, (\omega) = T(\omega)$$

where I is inertia, b is resistance, k is stiffness, Θ is angular position, T is torque, ω is
10   frequency, and $i = \{-1\}^{\frac{1}{2}}$.

12.   The method of claim 1, wherein said measuring musculoskeletal dynamics is performed using:
    a)   a platform to support the patient in a weight-bearing posture;
15   b)   a drive mechanism to impart pulse movement to said platform; and
    c)   a displacement sensor to sense displacement of said platform.

13.   The method of claim 12, wherein said measuring dynamics is also performed using:
20   a)   a force or torque sensor to sense a force or torque on said platform;
    b)   a control system to determine musculoskeletal dynamics based on outputs from said displacement sensor and said force or torque sensor.

14.   The method of claim 1, further including having said posture include standing.
25

15.   The method of claim 1, further including having said posture include muscles at said joint being active during assessment.

16.   A device for assessing musculoskeletal dynamics of a joint of a patient in a
30   weight-bearing posture, comprising:
    a)   a platform to support a patient in a weight-bearing posture;
    b)   a drive mechanism to impart pulse movement to said platform;
    c)   a position sensor to sense a position of said platform;
    d)   a force or torque sensor to sense a force or torque on said platform;

e)   a control system to determine musculoskeletal dynamics based on outputs from said displacement sensor and said force or torque sensor.

17.   The device of claim 16, wherein said musculoskeletal dynamics includes inertia.

18.   The device of claim 16, wherein said musculoskeletal dynamics includes damping.

19.   The device of claim 16, wherein said musculoskeletal dynamics includes neuro-mechanical resistance to rotational velocity.

20.   The device of claim 16, wherein said musculoskeletal dynamics includes stiffness.

21.   The device of claim 16, wherein said musculoskeletal dynamics includes neuro-mechanical resistance to ankle rotational angle.

22.   The device of claim 16, wherein said control system includes a control device configured to determine values of I, b or k based on data from the position sensor and the force or torque sensor in accordance with the following formula:

$$\{ -I\omega^2 + ib\omega + k \}\, \Theta\,(\omega) = T(\omega)$$

where I is inertia, b is resistance, k is stiffness, Θ is angular position, T is torque, ω is frequency, and $i = \{-1\}^{\frac{1}{2}}$.

23.   The device of claim 22, wherein said control device includes a computer programmed to determine values of I, b or k based on data from the position sensor and the force or torque sensor.

24.   The device of claim 16, wherein said control system includes a computer programmed to determine values of inertia, resistance and stiffness based on data from the position sensor and the force or torque sensor.

25.   The device of claim 16, wherein said drive mechanism is controlled to impart a random or pseudorandom series of pulses.

26.   The device of claim 25, wherein said drive mechanism includes an electric motor.

5

27.   The device of claim 25, wherein said drive mechanism is controlled via a control device.

28.   The device of claim 27, wherein said control device includes a programmed

10   computer.

29.   The device of claim 27, wherein a control device of the control system for determining musculoskeletal dynamics is independent from said control device that controls said drive mechanism.

15

30.   The device of claim 27, wherein a control device of the control system for determining musculoskeletal dynamics is the same as said control device that controls said drive mechanism.

20   31.   A device for assessing musculoskeletal dynamics of a body part of a patient in a weight-bearing posture, comprising:

        a)   a platform that supports a patient in a weight-bearing posture;

        b)   said platform being rotatably supported to rotate around an axis through said body part;

25   c)   a drive mechanism that imparts a plurality of pulses to said platform at durations of less than about 50 milliseconds and at intervals of less than about 100 milliseconds;

        d)   an angle sensor that senses an angular position of said platform;

        e)   a torque sensor that senses a torque at said platform;

30   f)   digital data storage having angle and torque time-based data from said angle and torque sensors.

32.   The device of claim 31, further including at least one control system to control said drive mechanism and to determining musculoskeletal dynamics based on said data in said digital data storage.

5

33.   The device of claim 31, wherein said device is configured to assess musculoskeletal dynamics of a patient's ankle in a weight-bearing upright standing posture and with the ankle rotating in an inversion and/or eversion direction upon said platform.

10

34.   The device of claim 31, wherein said angle and torque time-based data obtained from said angle and torque sensors includes at least about 10 data points per second.

15   35.   The device of claim 31, wherein said angle and torque time-based data obtained from said angle and torque sensors includes at least about 20 data points per second.

36.   The device of claim 31, wherein said angle and torque time-based data
20   obtained from said angle and torque sensors includes at least about 100 data points per second.

25

30